CLAIMS

What is claimed is:

1. A method for monitoring and controlling the biocatalytic efficiency of a wastewater treatment process comprising:
   a) providing an activated sludge environment comprising:
      (i) a carbon influx;
      (ii) cultures of autotrophic, heterotrophic and facultative microorganisms;
      (iii) a feed nutrient; and
      (iv) an end electron acceptor
   b) sampling wastewater from anaerobic, anoxic and/or aerobic stages of the treatment process;
   c) measuring the concentration of an internal storage molecule present in the sample to determine the status of a selected sample characteristic; and
   d) adjusting the feed nutrient in the activated sludge environment depending on the status of the selected sample wherein the biocatalytic efficiency of a wastewater treatment process is controlled.

2. A method according to Claim 1 wherein the internal storage molecule is selected from the group consisting of polyhydroxyalkanoates and glycogen.

3. The method according to Claim 2, wherein when the concentration of polyhydroxyalkanoates is greater than about 15 to about 20 dry weight percent of the biomass, there is an indication that the biocatalytic efficiency of the wastewater treatment process is impaired.

4. The method according to Claim 1, wherein the sampling is *in situ*.

5. The method according to Claim 1, wherein the sampling is continuous.

6. The method according to Claim 1, wherein the carbon influx comprises a compound selected from the group consisting of, amines, alcohols, organic acids, carbohydrates, proteins, and amino acids.

7. The method according to Claim 1, wherein the cultures of autotrophic, heterotrophic and facultative microorganisms comprise organisms selected from the group consisting of alpha, beta, and gamma Proteobacteria.

8. The method according to Claim 7, wherein the alpha, beta, and gamma Proteobacteria are selected from the genera consisting of *Paracoccus*, *Rhodococcus*, *Pseudomonas*, *Alcaligenes*, *Acinetobacter*, *Sphingamonas*, *Azoarcus*, and *Burkholderia*.

9. The method according to Claim 1, wherein the feed nutrient is selected from the group consisting of nitrate, ammonia, sulfate, sulfide, urea and phosphate.

10. The method according to Claim 1, wherein the end electron acceptor is selected from the group consisting of oxygen, nitrate, nitrite, nitrous oxide, ferric oxide, and sulfate.

11.The method according to Claim 2, wherein the polyhydroxyalkanoates are comprised of compounds selected from the group consisting of hydroxybutyrate and hydroxyvalerate.

12. The method according to Claim 1, wherein the sample characteristic is selected from the group consisting of denitrification efficiency, nitrate concentration, ammonia concentration, sulfate concentration, phosphate concentration, and carbon dioxide concentration.

13. A method of maintaining a viable culture in an activated sludge environment in the absence of carbon influx comprising:

a) providing an activated sludge environment comprising:
(i) a carbon influx;
(ii) cultures of autotrophic, heterotrophic and facultative microorganisms;
(iii) a feed nutrient; and
(iv) an end electron acceptor;

b) removing the feed nutrient from the activated sludge environment while continuously monitoring the concentration of polyhydroxyalkanoates present in the activated sludge environment;

c) removing the carbon influx from the activated sludge environment when the concentration of polyhydroxyalkanoates is greater than about 15 to about 20 dry weight percent of the biomass;

d) adding a minimal concentration of nitrate to the activated sludge environment of step (c);

wherein the cultures of autotrophic, heterotrophic and facultative microorganisms are maintained in a viable state in the absence of a carbon influx.

14. The method according to Claim 13, wherein the feed nutrient is selected from the group consisting of nitrate, ammonia, sulfate, sulfide, urea and phosphate.

15. The method according to Claim 13, wherein the carbon influx is removed from the activated sludge environment when the concentration of polyhydroxyalkanoates is greater than about 20 dry weight percent of the biomass.

16. The method according to Claim 13 wherein the removing the feed nutrient of step (b) occurs from about 8 to about 2 weeks prior to the removal of the carbon influx of step (c).